FIR ENGRAVER

Scolytus ventralis LeCont

IDAHO DEPARTMENT OF LANDS

State Forester Forum

The fir engraver is a small bark beetle that kills grand fir throughout Idaho. Trees are killed as the beetles bore through the bark to the surface of the wood where they chew out tunnels in the phloem (inner bark) as sites for laying eggs. Thousands of beetles will attack a single tree and the tunnels they construct girdle the tree, starving the roots. As they attack, the beetles carry spores of a brown-staining fungus into the tree that, as it grows, dries out the phloem tissue in advance of the feeding larvae, creating a more favorable environment for the beetle. The attacking beetles also introduce spores of a pouch fungus that rots the sapwood of the tree. This fungus grows small (1-1½ inch across), light-colored fruiting bodies or conks on the outside of the tree approximately a year after the attack by the beetles. These grow out of the hole made by the attacking beetles. The "pouch fungus" name is used because the fruiting body is hollow having an internal "pouch" where spores are produced. **(PICTURE OF CONK)**

This beetle makes successful attacks in trees that are weakened, having little resistance. Healthy, vigorously-growing trees resist beetle attacks by producing extra pitch that repels or kills the beetle and by producing phenolic compounds that serve as a barrier to the growth and advance of the brown-stain fungus. Unsuccessful attacks often do result in killing a small patch of cambium at the spot where the beetle chews into the tree. As the tree continues to grow, it produces new layers of wood that eventually calluses over the dead spot. There is often a recognizable, roughened or scared area of the bark that develops over the site of the dead tissue. **(PICTURE OF SCAR ON BARK)** Inside the wood, this dead spot creates a weak area where there is no structural strength. Boards cut from trees with many of these unsuccessful attacks often fall apart due to the lack of structural integrity.

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Rot also often develops at these sites. Thus, even though the unsuccessful attack does not kill the tree it may result in loss of value for lumber purposes.

Because of the tendency of this beetle to attack weakened trees, there is a close relationship between the fir engraver and root disease. Trees weakened by root disease become prime targets for this beetle. Drought is also a significant weakening factor as trees are severely weakened by lack of adequate water. In areas where trees are weakened by root disease, drought is especially damaging resulting in many fir engraver killed trees. Other situations that weaken trees and contribute to beetle success include defoliation by insects such as the Douglas-fir tussock moth or trees scorched by fire.

HOSTS: Grand fir, (*Abies grandis*), also sometimes locally known as white fir, is the principle host in Idaho. In California, true white fir (*A. concolor*) and California red fir (*A. magnifica*) are also preferred hosts.

LIFE STAGES and DESCRIPTION: The life stages are similar to other bark beetles, having eggs, larvae, pupae and adults. The adult is dark brown to black and slightly less than 1/4 inch long. The adults are recognizable as the posterior end is concave, curving from the top down and forward to the bottom of the body. **(PICTURE OF ADULT BEETLE**) This distinguishes this beetle and other members of the same genus from all other bark beetles which have a convex posterior. They have wings and are good flyers. As they make their attacks, the adult beetles chew out horizontal tunnels or egg galleries that are at right angles to the grain of the wood. Eggs, which are about the size of the head of a pin, are laid in niches cut along the sides of the gallery by the female beetle. After hatching, the larvae feed, tunneling up or down the trunk. Pupation and transforma-tion to the adult stage occurs at the end of the larval tunnel. The larvae are creamy white with a brown head, legless, and when fully developed, about 1/4 inch long. The pupa is also white, and has a form more like the adult insect except that the wings and wing covers are folded around the body, exposing the abdomen. The newly formed adult is light brown, and is termed a "callow adult". It stays under the bark until fully mature.

LIFE HISTORY: The fir engraver has one generation per year. Attacks normally start in mid-June continuing into July, and terminating by the end of July. The larvae feed in the inner bark developing to fully-grown larvae by fall and overwintering in this stage. They change to the pupal stage in spring and the next generation of adults is ready to emerge as new adults by mid June of the following year.

SIGNS OF ATTACK: It is extremely difficult to find signs or symptoms of attacking fir engraver beetles. Their attacks are usually made under bark scales and, even though they keep their galleries free of boring dust or “frass,” there are no easily observable indicators that the tree is being attacked. Because of this, newly attacked trees

are usually not discovered until nearly a year later when they begin to fade and turn a rusty-red color. Trees killed by this beetle fade in much the same manner as other beetle-killed trees, going through a succession of colors from yellow to red.

STAND MANAGEMENT (SILVICULTURAL ALTERNATIVES) : There are few silvicultural recommendations for maintaining grand fir in a stand. Thinning stands may increase tree vigor and resistance to the fir engraver. However, in North Idaho root disease appears to be so ubiquitous that thinning may actually exacerbate the problem. The roots of trees cut in a thinning operation have no resistance to root disease and will be readily invaded by the fungi responsible for this disease. Due to root grafts between neighboring trees, the root disease fungi then have a direct pathway into the roots of the leave trees weakening them and increasing their susceptibility to attack by the fir engraver. Thus, depending on management objectives, the best long-term recommendation may be to convert the stand from shade tolerant grand fir to the shade intolerant pines and larch of a seral stand. Since these species are also resistant to root disease they may be especially desirable for long-term stand sustainability and forest health.

BEETLE MANAGEMENT:

NATURAL CONTROL While woodpeckers and insect enemies of the fir engraver do exert pressure on beetle populations, they have never been known to control outbreaks to any degree.

IDAHO DEPARTMENT OF LANDS

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